upon force as a cause of motion. Thus, § 138, when dealing with a simple pendulum, he writes: "The idea that F, T" (certain quantities appearing in his equations) "on the left denote forces in the sense of causes of motion and that the expression on the right are effects is a fallacy." He does, however, permit himself to speak of stresses as causing motion; it would surely be better to avoid the idea of causation entirely; it is doubtful if anything is gained by the distinction between "stress," as used by Prof. Gray, and "force." The term stress does, it is true, call attention to the fact that the action it denotes is a mutual one between two or more bodies, and this is wanting in the term force. Still, is is difficult to be consistent in the matter; thus, § 146, in dealing with Atwood's machine, we read, "putting T for the mass-acceleration *due* to the force applied to either mass"—the italics are not in the original. When once it has been explained that forces are measured by mass-accelerations, might we not write more simply and with equal effect the words, putting T for the tension of the string?

Observation shows us that in many cases the mass-acceleration of a particle is a constant; if we know the value of this constant from the conditions of the problem we can, having given the initial conditions, determine the motion; we say, for brevity, that the particle is moving under a constant force. In other cases, it has been observed that the mass-acceleration is a known function of the position of the particle relative to other particles. This function can often be calculated without any knowlegde of the velocity or acceleration of the particle; thus, if there be a second particle at a distance r from the first, each will have a mass-acceleration towards the other equal to mm'/r^2 where m and m' are the masses of the two particles. This is the force under which either particle moves. Having given this force, by equating it to the mass-acceleration, and solving the equations we can determine the motion. Thus the resolution of any problem of motion of a particle falls into three parts: (1) We determine from the conditions the mass-acceleration in each of three rectangular directions; (2) We equate these to the analytical expression giving these mass-accelerations in terms of the coordinates of the particle and their differential coefficients with respect to the time; (3) We solve the resulting equations.

We may consistently employ the name force for the quantities determined under (1), and indeed may speak of them as the forces impressed on the particle without implying that they are the cause of the motion. This is done in the later sections of the chapter. One other criticism occurs in connection with the sections of the book immediately under review. Prof. Gray writes, § 134, "The word weight is used in two senses, in the sense of the quantity of matter in a body, and sometimes, though perhaps more rarely, in popular language as the downward force of gravity on a body in certain specified circumstances. It seems impossible to discard the former use of the term even in scientific speech, and therefore we shall use the word generally in this sense and in the latter sense speak of the gravity of a body."

Again, in the next section we find the sentence, "We may take the inertia of a body as the measure of the quantity of matter in the body or, as it is called, the body's mass."

Thus weight and mass are to be used as synonymous, contrary to the practice of writers on dynamics during many years past. Such a change, unless the grounds for it be very strong, must lead only to confusion, and the fact that weight is used ambiguously in daily life is hardly a satisfactory reason for the innovation which has been adopted.

We have referred at length to these few pages of the work because of the importance of the fundamental ideas and conceptions with which they deal. It is impossible to deal with the rest in the same manner, nor, indeed, is it necessary. The reader will find the book a storehouse of valuable information, which is generally put clearly and well; experience alone will show whether or no it is useful for students "beginning at the elements of the subject." However this may be, the book should be found in every physical library, and is sure to be frequently consulted.

TROPICAL CRUSTACEANS.

The Stalk-eyed Crustacea of British Guiana, West Indies, and Bermuda. By Charles G. Young, M.A., M.D., Dublin, Member of the Royal Irish Academy, lately of the British Guiana Medical Service. 8vo. Pp. xix + 514; 7 plates, coloured, and numerous outlines. (London: Watkins, 1900.) Price 12*s.* 6*d.* net.

FROM the equator to thirty-five degrees north the western Atlantic, with its neighbouring shores and rivers, can supply a group of stalk-eyed Crustacea not easily surpassed in interest by such a fauna from any other region in the world. The descriptions relating to this group lie scattered over numerous treatises. Dr. C. G. Young has conceived the meritorious idea of bringing them together under one cover. He modestly speaks of his performance as a hand-list for the use of collectors. Handiness and usefulness should therefore be among its characteristic features. As it lays no claim to originality, the virtues of accuracy, completeness and condensation might have been expected. In place of these there is offered to the student a volume expansively and expensively printed; serious omissions are balanced by a parade of unneeded trivialities; whilst from one end to the other slovenliness prevails in the use of older authorities and neglect or ignorance of those that are more recent. Like the curate with a questionable egg at an episcopal breakfast table, one might say of this book that "parts of it are good, my lord," but no one can tell which parts without consulting the very authorities which its publication presumes to be out of reach.

The first page includes an old definition of the class Crustacea, informing us that in these animals the body is "composed of segments, in general very distinct, motile," and this is followed by hundreds of pages dealing with crabs, in which, as Dr. Young well knows, for many or most of the component segments the distinctness is almost null and the "motility" absolutely *nil*. The end of the story is on a par with its beginning. It treats of the Squillidæ, and describes four species, adopting the synopsis of the genera from the work of Brooks on the *Challenger* Stomatopoda, but calmly assigning to the genus Squilla two species which, according to that very synopsis, belong

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to Lysiosquilla. The discussion of a true Squilla from the coast of Yucatan by J. E. Ives in 1891, and the truly valuable report on the Stomatopoda of the *Albatross* by Dr. R. Payne Bigelow in 1894, were evidently unknown to Dr. Young. Naturally, therefore, he leaves unnoticed the species new or old in this or other orders recorded by those two writers. Perhaps his attention was too much concentrated on older essays, and, as these are often much less accessible than modern treatises, such a fault would deserve to be leniently regarded. It was, indeed, with some eagerness that the present reviewer, on first opening the book, turned to the excellent index for the name Glypturus. Of this genus Miss Mary J. Rathbun last year published a new species from Brazil. That is not in the region with which Dr. Young's work is concerned, but the genus was established long ago by Stimpson in the *Proceedings* of the Chicago Academy of Sciences, vol. i. p. 46, 1866, with repetition in the *Annals* of the Lyceum of Natural History of New York, vol. x. p. 120, 1874, for a species "not uncommon among the Florida Keys." Of this Dr. Young has nothing to tell us. He mentions, indeed, two species of the same family, *Callianassa occidentalis*, Bate, and *Callianassa major*, Say, but he was obviously not in a position to inform his readers that Stimpson instituted the genus Callichirus to receive Say's species, and he does not take the trouble to tell them that Bate's species was founded on a single leg, which left Bate himself doubtful as to its generic position.

On generic and specific names and lists of synonyms there are various opinions, but most naturalists agree that quoted names had better be quoted correctly, and that an author would do well not only to verify his references, but to give others a reasonable chance of verifying them after him. Dr. Young's adhesion to these views may be complete in principle, but is made very doubtful by his practice. The scope of his work scarcely required a "synonymy" for the term Brachyura, still he has been pleased to give one. It leads off with the information that the word was adopted by 'Leach, Latreille, Dana, Linné, Claus, Haswell, Miers,' Linné's name as a centrepiece reminding one of those Welsh genealogies which are reputed to have Adam halfway down the ancestral line. Where and when Linnæus changed his *Cancri Brachyuri* into Brachyura we are not told, and are never likely to be. The synonymy continues in separate lines with '*Brachyura*, H. Milne Edwards,' '*Cancri Brachyuri*, Lamarck,' '*Klistognatha*, Fabricius,' '*Tetrogonostoma*' bracketed with '*Trigonostoma*, Macleay.' Here again we are not told when it was that Fabricius changed the Kleistagnatha of his Supplementum into Klistognatha, and as for the implied but ungiven reference to Smith's "Illustrations of the Zoology of South Africa," there is confusion doubly confounded. In that work McLeay adopts and uses the term Brachyura in common, not only with half a dozen authors, but with half a hundred or an indefinite number. He divides the group into two tribes, and it is to these he assigns the names above quoted, with the difference that he spells the first of them correctly as Tetragonostoma. In dealing with genera and species Dr. Young shows no more ceremony than with the higher groups. He attributes *Podochela reisei* to Stimpson, A. Milne Edwards and Miers, though certainly the first and last write the specific name *riisei*, and Stimpson says that it 'was found at the Island of St. Thomas by Mr. A. H. Riise, after which indefatigable investigator of West Indian natural history we have named the species.' For the genus Ibacus, Leach, Spence Bate's spelling, Ibaccus, is adopted, and Leach is accused of having written Ibachus. *Cardiosoma carnifex* is attributed to Herbst, though he died long before the species intended was assigned by Latreille to Cardisoma. The young German naturalist, von Willemoes Suhm, who died on the *Challenger* expedition, is uniformly referred to as Suhn. The Pandalidæ are defined without any regard to the discovery published by Caullery and by Calman two years ago that the front feet in this family had been misdescribed. And, as if all this were not enough, the unhappy author re-introduces the name *Uca una*, Marcgrave de Liebstad, without mentioning the year 1648 as the date of it, and in defiance, or perhaps in ignorance, of all the trouble and accurate learning with which Miss M. J. Rathbun has shown that this typical West Indian species ought rightly to be called *Ucides cordatus* (Linn).

There are some interesting local names given. We are told, for example, that *Panulirus guttatus* is called in Barbados the "Guinea bird lobster." The pages have satisfactory margins. There is room, therefore, for a naturalist with leisure, by supplementary notes, corrections and verifications, to give the book a solid value.

T. R. R. S.

PRACTICAL INORGANIC CHEMISTRY.

Praktikum des anorganischen Chemikers. Von Dr. Emil Knoevenagel. Pp. viii + 332. (Leipzig: Veit and Co., 1901.) Mk. 7.80.

THE fact that this book emanates from the Heidelberg Laboratory and is dedicated to the memory of the great teacher who first gave that laboratory its fame is calculated to enlist the expectant attention of a critic. The book purports to be an introduction to inorganic chemistry on an experimental basis, and the object is to associate the directions for practical work with adequate theoretical explanations of the phenomena involved. It is, in fact, a blend of preparations, qualitative analyses, quantitative experiments and theoretical chemistry. The plan of the work as a whole is hardly describable, but some idea of its detail may be gathered from the beginning. The student is told to weigh out four grammes of caustic soda, dissolve it in water and make up to 50 c.c. Then, parenthetically, he is asked to calculate the content of caustic soda per litre, to express this in gramme molecules and to say what is the normality. The student is next told the solubility of caustic soda at 15° and 100°, and also informed that the density can be used to measure the concentration. The boiling points of solutions of various concentrations are given. The solution is now to be tested with litmus and turmeric and also to be tasted. Caustic soda is affirmed to be a strong base. A piece is to be left exposed to the air; it is said to deliquesce and also to absorb carbon dioxide, a property of all strong

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